

CLAIMS

What is claimed is:

1. A method for estimating the depth of a hole through a workpiece, the method comprising the steps of:

providing a light recording apparatus;

placing the light recording apparatus at a predetermined first distance away from a surface of the workpiece proximate the hole;

providing a light source apparatus;

illuminating a side surface of the hole with a light emitted from the light source apparatus;

recording an image of a far side surface of the hole with the light recording apparatus;

determining a hole image size indicative of a diameter of the image;

determining a hole size indicative of a diameter of the hole;

employing the hole image size and the hole size to calculate a second distance indicative of a distance between the light recording apparatus and the far side surface of the hole; and

determining the depth of the hole by subtracting the first distance from the second distance.

2. The method of Claim 1, wherein the hole size is determined based on a diameter of a drill bit that was used to create the hole in the workpiece.

3. The method of Claim 1, wherein the hole size is determined based on a hole image size of a near edge surface of the hole.

4. The method of Claim 1, further comprising the step of placing a device in the path of light emitted from the light source apparatus to generally align the emitted light with an axis of the hole.

5. The method of Claim 4, wherein the device is selected from a group consisting of beam splitters and mirrors.

6. The method of Claim 5, wherein the beam splitter or mirror is located within the light recording apparatus.

7. The method of Claim 1, wherein the light source is placed on the same side of the hole as the light recording apparatus.

8. A method for estimating the depth of a hole in a surface of a workpiece, the method comprising the steps of:

providing a reticle;

placing the reticle at a predetermined first distance away from the surface of the workpiece proximate the hole;

providing a light source apparatus;

illuminating a side surface of the hole with a light emitted from the light source apparatus;

viewing an image of a far side surface of the hole through the reticle;

determining a hole image size indicative of a diameter of the image;

determining a hole size indicative of a diameter of the hole;

employing the hole image size and the hole size to calculate a second distance indicative of a distance between the reticle and the far side surface of the hole; and

determining the depth of the hole by subtracting the first distance from the second distance.

9. The method of Claim 8, further comprising the step of placing a device in the path of light emitted from the light source apparatus to generally align the emitted light with an axis of the hole.

10. The method of Claim 9, wherein the device is selected from a group consisting of beam splitters and mirrors.

11. The method of Claim 8, wherein the light source is placed on the same side of the hole as the light recording apparatus.

12. An apparatus for estimating a depth of a hole drilled in a surface of a workpiece, comprising:

a robot;

a drill, the drill coupled to the robot and operable for forming the hole;

a light recording apparatus, the light recording apparatus coupled to the robot, the light recording apparatus being operable for obtaining an image of a far side surface of the hole; and

a controller, the controller evaluating a size of the image, a distance between the surface of the workpiece and the light recording apparatus, and an actual size of the hole and determining the depth of the hole.

13. The apparatus of Claim 12, further comprising a light source apparatus, the light source apparatus coupled to the robot.

14. A method for estimating the depth of a hole through a workpiece, the method comprising the steps of:

providing a light recording apparatus;

placing the light recording apparatus at a predetermined first distance away from a surface of the workpiece proximate the hole such that an optical axis of the light recording apparatus is positioned at a predetermined angle from an axis of the hole;

providing a light source apparatus;

illuminating a side surface of the hole with a light emitted from the light source apparatus;

recording an image of a side surface of the hole with the light recording apparatus;

determining a hole image position indicative of a location of the light recording apparatus;

determining a hole side image length indicative of a projected depth of the hole; and

employing the first distance, the optical axis of the light recording apparatus, the hole image position and the hole side image length to calculate the depth of the hole.

15. The method of Claim 14, further comprising the step of placing a device in the path of light emitted from the light source apparatus to generally align the emitted light with the axis of the hole.

16. The method of Claim 15, wherein the device is selected from a group consisting of beam splitters and mirrors.

17. The method of Claim 16, wherein the beam splitter or mirror is located within the light recording apparatus.

18. The method of Claim 14, wherein the light source is placed on the same side of the hole as the light recording apparatus.